The Mechanical Enginhering Laboratory of the O. S. U.

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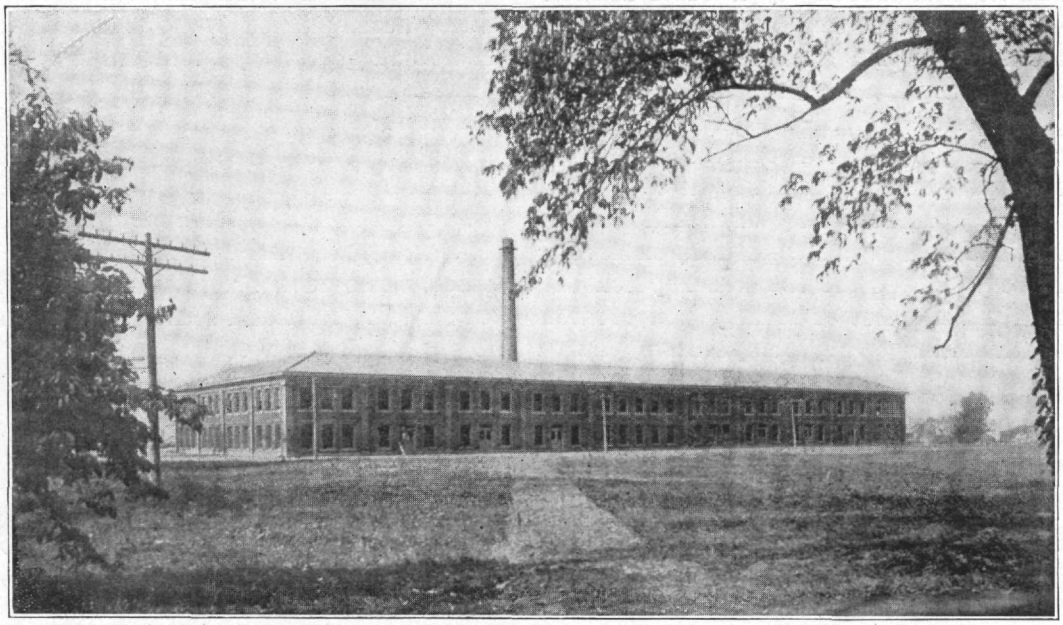

Fig. 1—Front Exterior View from South-East

It is not the purpose of the following article to give complete and detailed information about the equipment of the Mechanical Engineering Laboratory of the Ohio State University, but rather to give, mainly by means of pictures, only a general idea of the facilities provided for doing work in this laboratory.

The Mechanical Engineering Laboratory is located in the building known as Robinson Laboratory, named after Professor S. W. Robinson, who introduced the first regular course in mechanical engineering at the Ohio State University. This building was erected in 1908, and houses both the electrical and mechanical engineering departments. It is of modern mill construction, having a saw-tooth roof of trussed steel, supported on steel columns 22 feet in height. Its general appearance may be seen from Figs. 1 and 2. It is of dark red corduroy-faced brick, the part of the roof visible from the front and sides being of red tile. The whole building is 308 feet long and 112 feet wide, with the exception of a projection near the center of the rear, which is 48 feet wide and extends 26 feet beyond the general line of the building. At each end is a section 25 feet in width, which is two story, and is used for recitation rooms, offices, etc. The rest of the building is divided into eight bays, seven of them being 30 feet in width, and the eighth, near the center, being 48 feet wide. The five bays on the south end are used by the mechanical engineering department.

A view looking west in the first bay at the south

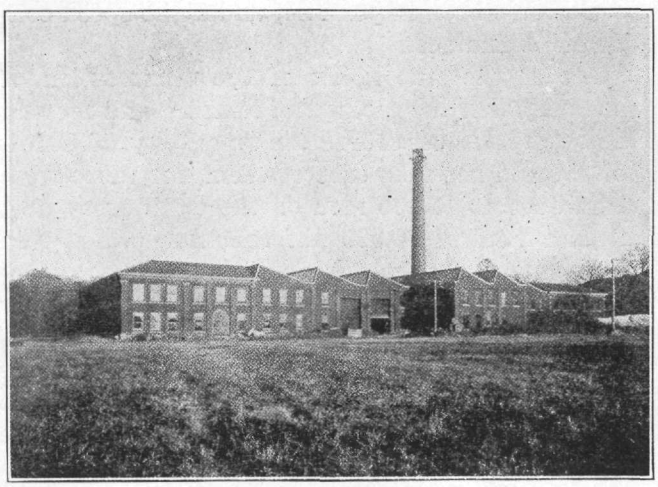

Fig. 2—Rear Exterior View

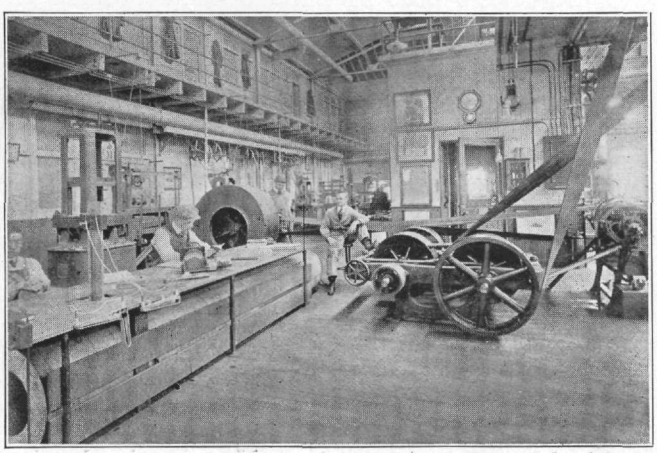

Fig. 3—Materials Testing Section

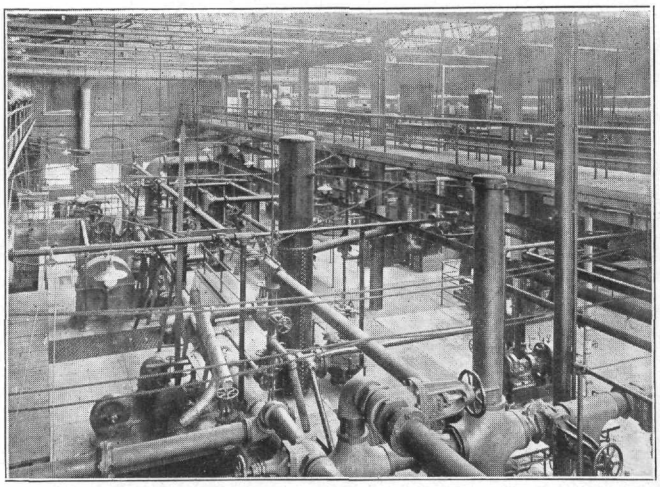

Fig. 4—Hydraulic Section from the East

end is shown in Fig. 3. This bay is used mainly for materials testing work. At the left some of the testing machines may be seen. They comprise a 200,000, a 100,000, and a 50,000 lb. machine for compression and tension, a 20,000 wire testing machine, a torsion machine, and a 10,000 lb. beam testing machine. In the foreground a centrifugal fan is shown, as arranged for testing. This fan is driven from an overhead motor driven line shaft, thru a speed changing device (in the center) and a transmission dynamometer (at the ex-

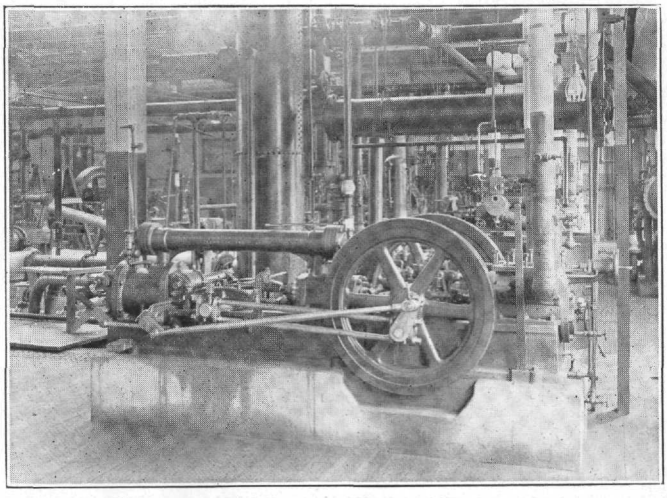

Fig. 5—Two Stage Air Compressor

treme right). One of the doors on the wall at the left, leads into the oil testing room, in which is a friction machine, and other apparatus used in oil testing. Another one of the doors at the left opens into the instrument room, in which the portable instruments used in the instructional and testing work in the laboratory, are kept. Just to the right of the center of the picture may be seen the door of the shop, which is equipped to take care of the ordinary work of repair and constructing new equipment.

A general view, looking west, of the second bay from the south, which is used for work in hydraulics, is shown in Fig. 4. About 80 feet of this section is taken up by a set of twelve measuring cisterns of different sizes, and an observation well in which are located glass gages and hook gages which are connected to the different cisterns so that the water level in any cistern may be easily and accurately determined. Most of these cisterns are at least partly covered with steel buckle plates having a concrete top, forming a floor strong enough to support heavy machinery, yet of such size as to permit of their being removed when

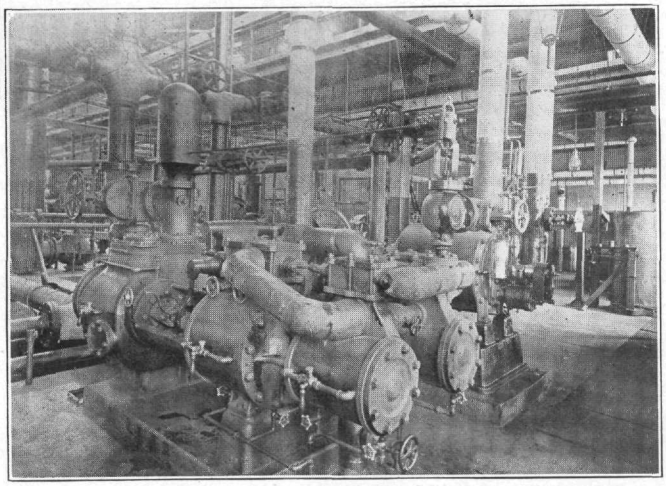

Fig. 6—Tandem Compound Duplex Pump

necessary. This picture, Fig. 4, shows the balconies which are built along the columns supporting the roof, and which are used mainly for drafting and computing work.

Among the more important pieces of apparatus located at the east end of the hydraulic section, an 8 and 8 and 5 x 10 inch two-stage air compressor, shown in Fig. 5, connected to a small surface condenser, a 12 and 7 x 12 inch outside packed plunger pump, a 10 and 16 and 12 x 10 inch tandem compound duplex pump shown in Fig. 6, and a steam turbine driven single-stage centrifugal pump, shown in Fig. 7, and having a capacity of

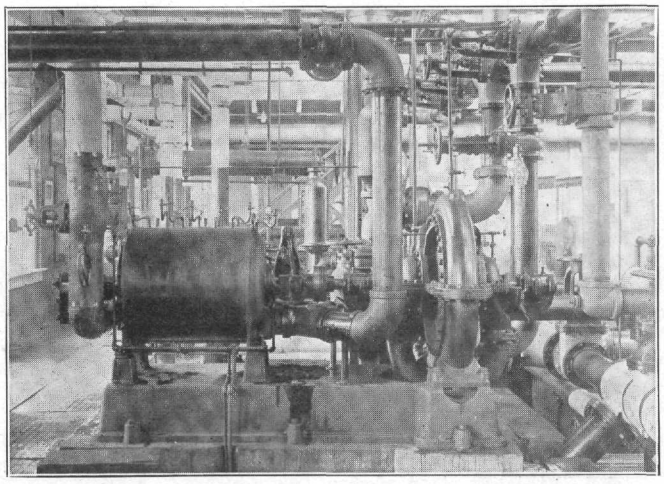

Fig. 7—Turbine Driven Centrifugal Pump

1000 gallons of water per minute against a head of 80 pounds, may be mentioned. These last two units are arranged to exhaust either to the atmosphere, or into a surface condenser which is not shown. Just back of the air compressor in Fig. 5, a standpipe may be seen. This is 24 inches in diameter and 24 feet high, and has a closed top with a vent pipe so that pressures up to 100 pounds may be carried. A 24 x 48 inch drum is connected to the bottom of this standpipe, with attachments on the front for holding different forms of orifices, nozzles, etc. In the center of

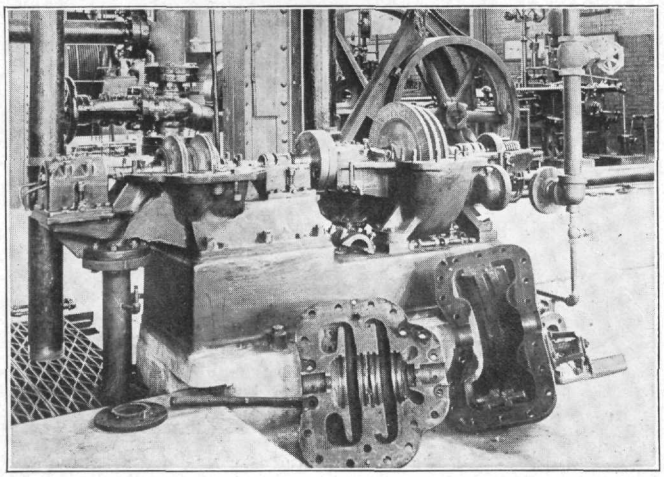

Fig. 8—Steam Turbine Driven Centrifugal Pump

Fig. 4, another standpipe is shown, to which a ten inch water turbine is connected.

Fig. 8 shows a two-stage steam turbine driven centrifugal pump, the cover of both the pump and turbine being removed. This pump has a capacity of 200 gallons of water per minute against a head of 416 feet. Besides the apparatus already mentioned, this section contains several impulse wheels, an hydraulic ram, and other minor pieces of apparatus.

A view looking east in the steam engine section is shown in Fig. 9. A 10-¾ x 30 inch Corliss en-

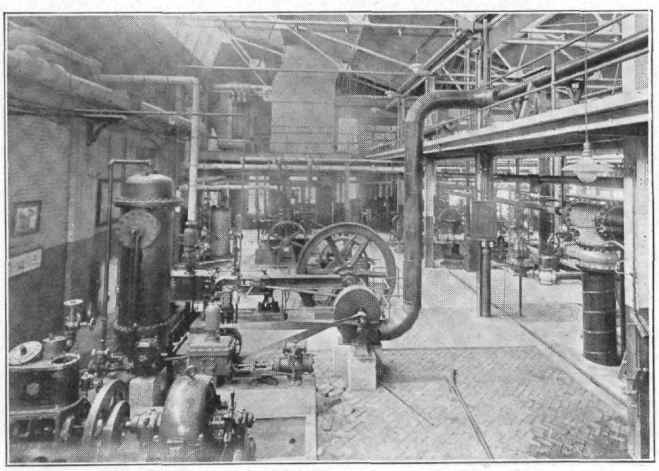

Fig. 9—The Steam Engine Section from the West

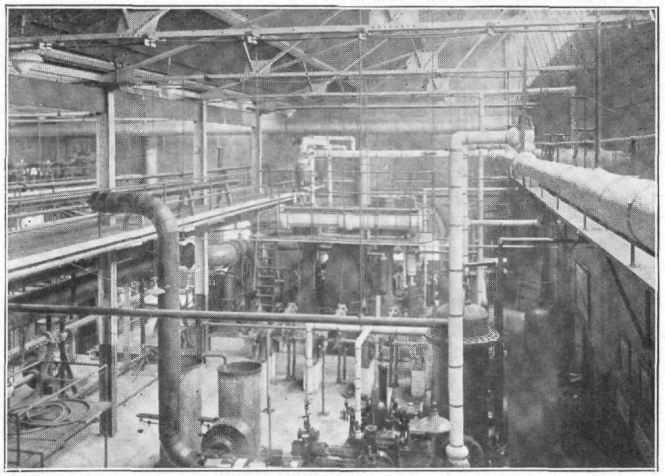

Fig. 10—The Steam Engine Section from the East

gine may be seen near the center of this picture. Behind the Corliss engine is a 4-½ and 10 x 6 inch vertical tandem compound engine, which was designed solely for instructional and experimental purposes by Professor W. T. Magruder, and built largely by students in the shops of the Department of Industrial Arts. Beyond this engine, there are

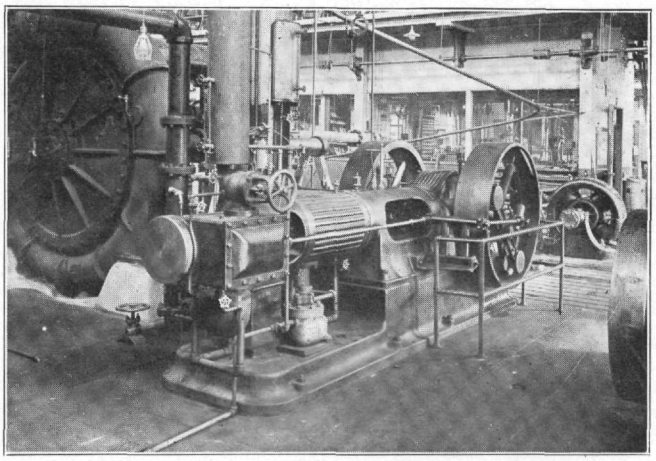

Fig. 11—Sixty H. P. Tandem Compound Steam Engine

two small slide valve engines which are used largely for valve setting work. All of these engines are arranged to exhaust either into surface condensers or to the atmosphere.

Figure 10 is a view of the steam engine section from the east. The engine near the center of this figure is a 13 and 25 x 16 inch vertical cross compound with a reheating receiver. It will develop 225 horse power, and is direct connected to a centrifugal pump which has a capacity of 12000 gallons per minute against a head of 50 feet. A 60 horse power 8 and 13 x 12 inch tandem compound steam engine, which is also located in this section, is shown in Fig. 11. On the left in this Fig. may be seen the centrifugal pump mentioned above, and on the extreme right the flywheel of a 9 x 12 inch simple high speed steam engine which will develop 40 horsepower.

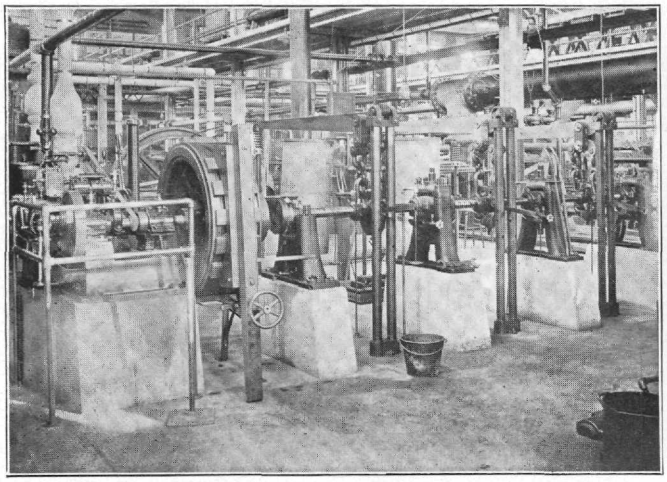

Fig. 12—Bearing Testing Machine and Uniflow Steam Engine

Fig. 12 shows a modern bearing testing machine with which three bearings can be tested simultaneously. It was designed by Professor W. T. Magruder, and is driven by a 6-½ x 8 uniflow steam engine. This engine has a single eccentric variable cut-off and reversing type of valve gear, and will develop 45 horse power when running at 400 r. p. m.

The boiler laboratory is located just beyond the steam engine section. A view of this laboratory, looking towards the east is given in Fig. 13. It contains an internally fired fire tube boiler, a locomotive boiler, a horizontal return tubular boiler, and a horizontal water tube boiler. The locomotive boiler has been sectionalized to show its construction, but the others are in good condition for service. Fig. 14 is a better view of the water tube boiler, showing also the feed pumps, the economizer, and the independently fired superheater. This boiler is arranged so that it can be stoker fired at one end, or hand fired at the other end. It is equipped with feed water regulators and steam meters, and other instruments used in testing. At the west end of the boiler laboratory a 60 horsepower suction gas producer, which will burn either

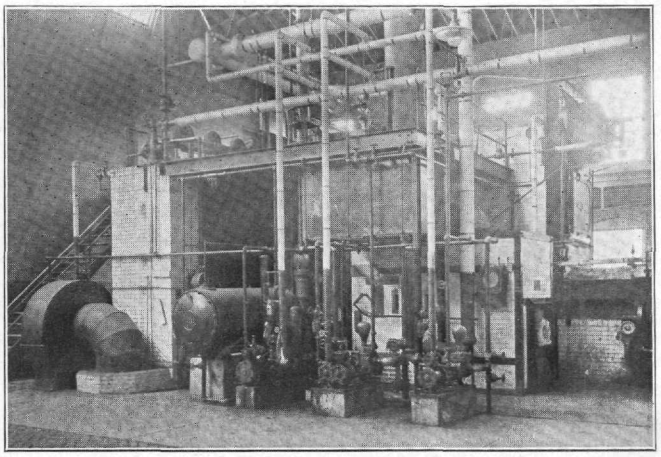

Fig. 14—Water Tube Boiler, Superheater

anthracite or bituminous coal, is located.

The gas engine laboratory is just to the west of the boiler laboratory. It contains a 14 x 18 inch single-acting tandem horizontal four-stroke cycle

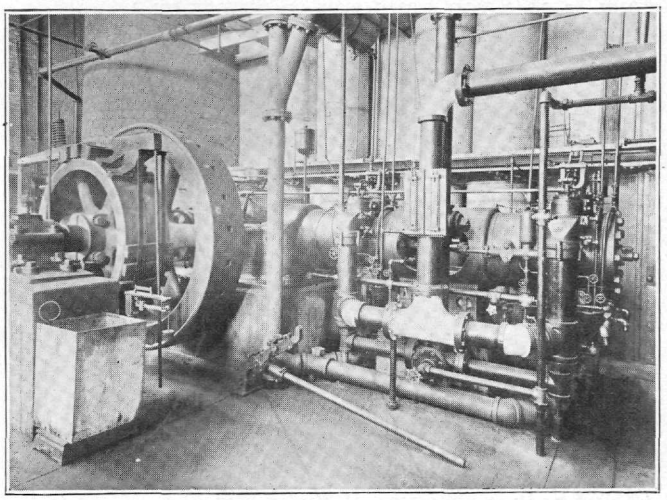

Fig. 15—Two Cycle, Tandem, 100 H. P. Gas Engine and Economizer

gas engine, rated at 100 horsepower when using natural gas, and shown in Fig. 15, a 25 horsepower two cycle and a 15 horsepower vertical four cycle gas engine shown in Fig. 16, and four oil

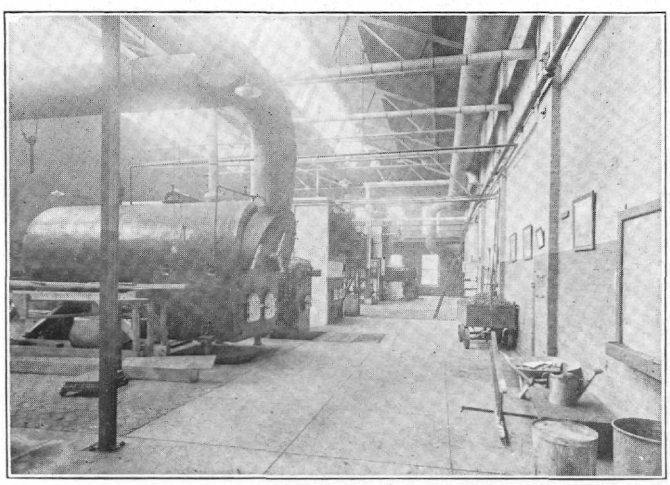

Fig. 13—Boiler Laboratory Looking East

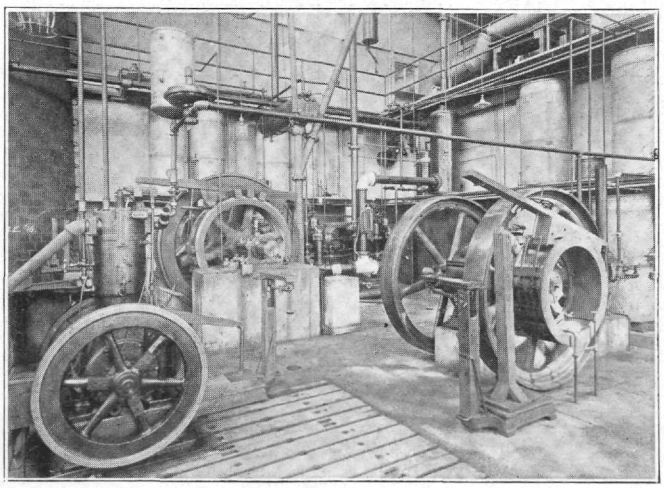

Fig. 16—Gas Engine Lab. Looking South-East

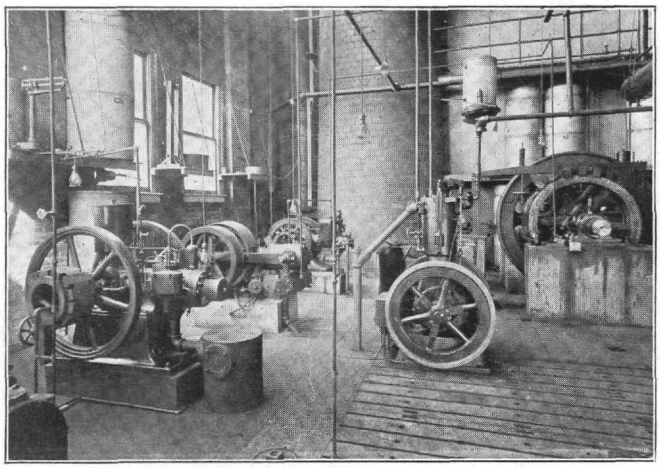

Fig. 17—Gas Engine Lab. Looking North-East

engines, three of which are shown at the left in Fig. 17. All of these engines are arranged for testing.

One of the most recent additions to the laboratory is a 12-ton ammonia compression refrigerating plant. This is in the bay just to the north of the boiler laboratory, and is shown in Fig. 18. The compressor is driven by a steam engine, and is located above two heat insulated rooms which may be cooled to low temperatures. The plant may be used either for experimental work in refrigeration, or for work where it is desired to ascertain the effect of freezing upon bricks, concrete, or other materials.

In the same section with the refrigerating plant are located a 4-stage compressor and liquifier for making liquid air (shown at the bottom of Fig 18), and a 60-horse power electric dynamometer which provides means for testing automobiles and their engines in a variety of ways.

In conclusion, the author wishes to congratulate all students who are able to take advantage of the

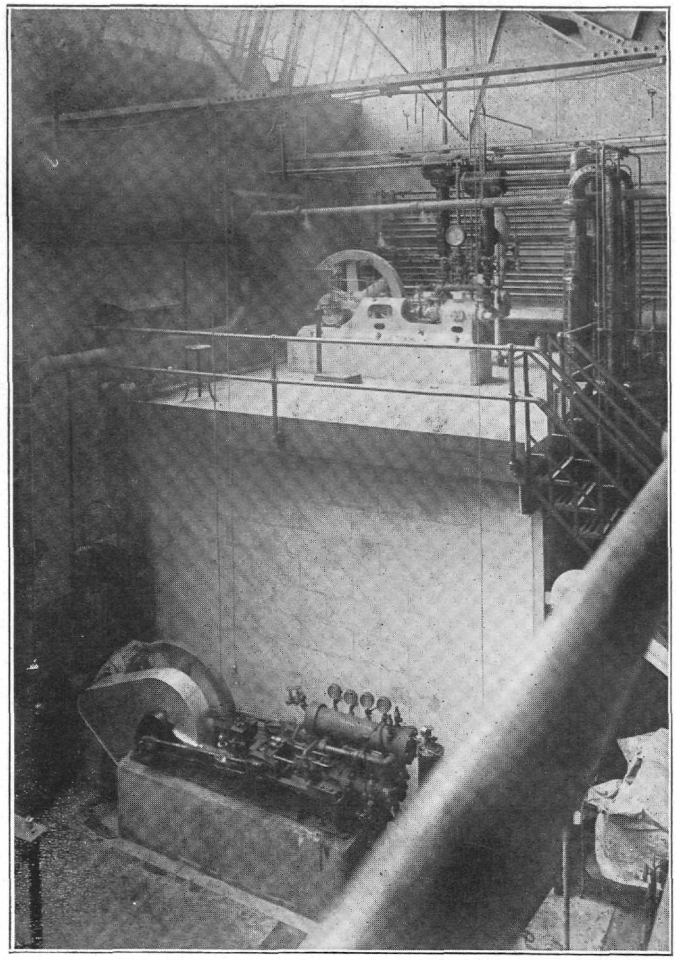

Fig. 18—Refrigerating Plant and Liquid Air Machine

excellent facilities which the State has provided for experimental work in mechanical engineering. It is his ardent wish that sufficient funds will be forthcoming from year to year to make it possible to add the new equipment necessary to keep up with the rapid development along mechanical engineering lines.